



24K MAGIC

How data helped turn a Gold mine around

Presented by **Peter Smith, Metallurgy Superintendent**
Gavin Strack, Director





G'day from Australia!

Australia



Australia – Interesting Facts

We are multicultural

- 27% of Australians were born overseas

We have easy going attitudes and language

- The most widely used Australianisms are “no worries”, “arvo” and “G’day”
- We call everyone “mate”

We love technology

- The average Australian spends more than 10 hours a day in front of a screen
- We have a population of 24m, who own over 15m smart phones and over 11m tablets
- The “Silicon Valley” of mining is in Perth, Western Australia

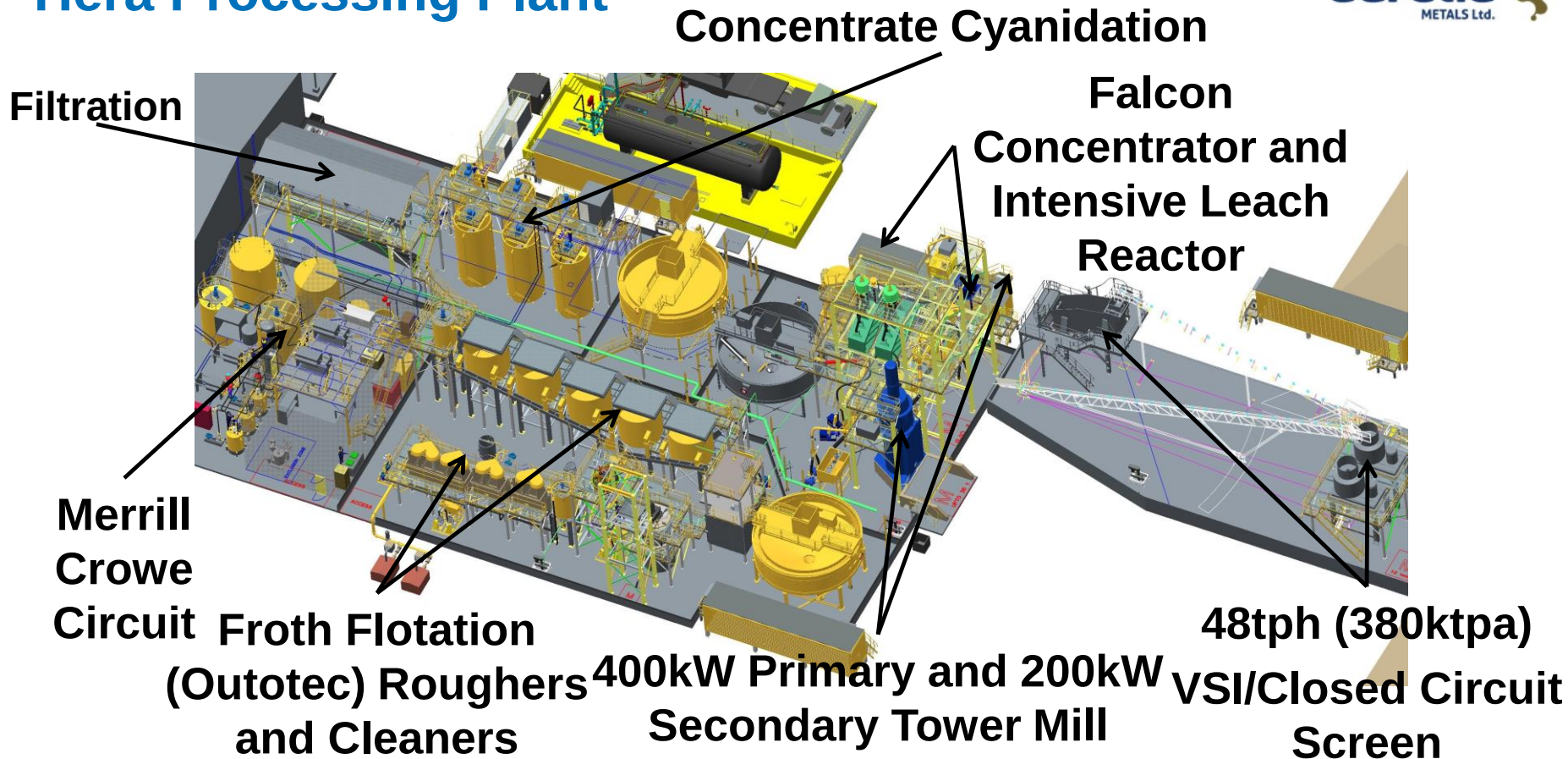


About Us

Hera Processing Plant



Hera Processing Plant



Gold-Silver Dore
Lead-Zinc Concentrate

Commercial Production : 2015
Dec 2016 : Quarterly Report:

- 97,778 t ore processed
- 13,427 oz Gold

Automation Consultancy

Business Improvement
Process Control Optimisation
PI System Integration
PI System Management
Software Development



Our Improvement Story

The Problem – December Quarter 2015

- Gold recovery was low (74.6%)
- EBITDA/Net Debt ratio was low (2.7%)
- Cash/Net Debt ratio was low (7.5%)
- Gold margin was low (7.1%)

The operation needed to be more profitable to survive the projected future of higher costs

Capital was constrained

The Challenges

- Data was hard to obtain - no historian
- Data capture was manual labour intensive
- Complex processing plant
- Very complex code base used in the control system
- Au Recovery was low(~78.6% January 2016)
- Throughput was lower than design

The Baseline



I need a
PI System

No worries
mate



Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6				
Au Production (oz)	9,432				
AISC (\$/oz)	1,348				
EBITDA (\$m)	3.38				
Net Debt (\$m)	125				
Cash (\$m)	9.36				

March 2016 Quarter

- PI System Install
- Lab Report Solution using the PI System
- Grinding Circuit Optimisation
- Installed **ASSURE**

Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6				
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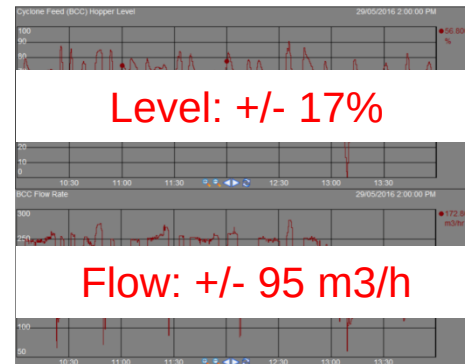
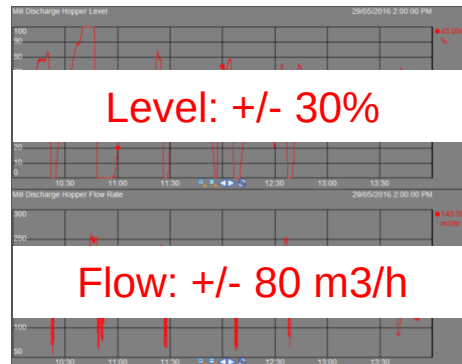
Grinding Circuit Optimisation Results

Mill Feed

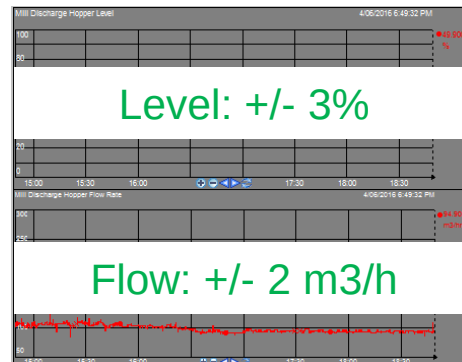
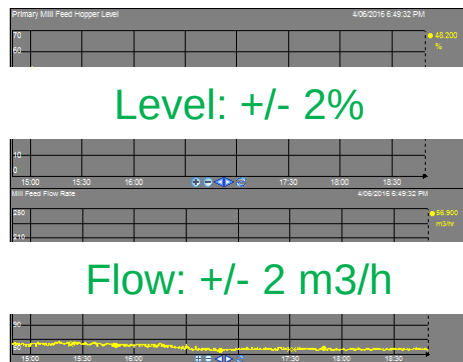
Mill Discharge

Cyclone Feed

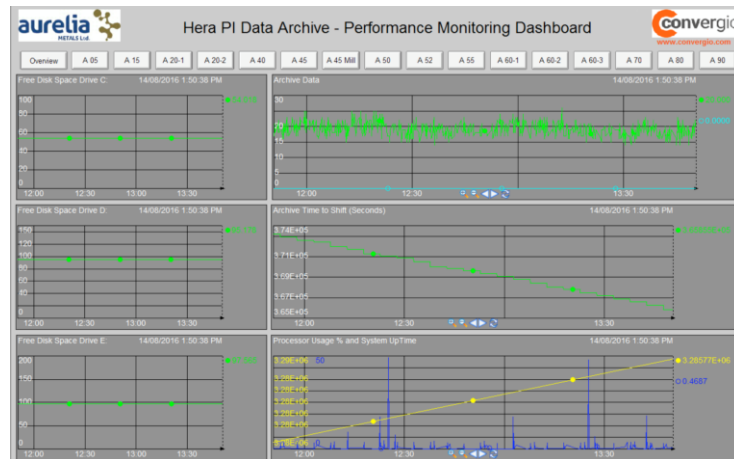
Before



After



Protecting the new PI System with ASSURE



Making sure your PI System is online and doing its job

- Real-Time performance dashboard
- Automatic fault notifications
- Data Point & AF Element administration

March 2016 Quarter

- Au Recovery ↑ 6.6%
- AISC ↓ 14.4%
- Net Debt ↓ \$15m

Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6	81.2			
Au Production (oz)	9,432	14,184			
AISC (\$/oz)	1,348	1,153			
EBITDA (\$m)	3.38	10.9			
Net Debt (\$m)	125	110			
Cash (\$m)	9.36	14.79			

June 2016 Quarter

- Flotation Optimisation

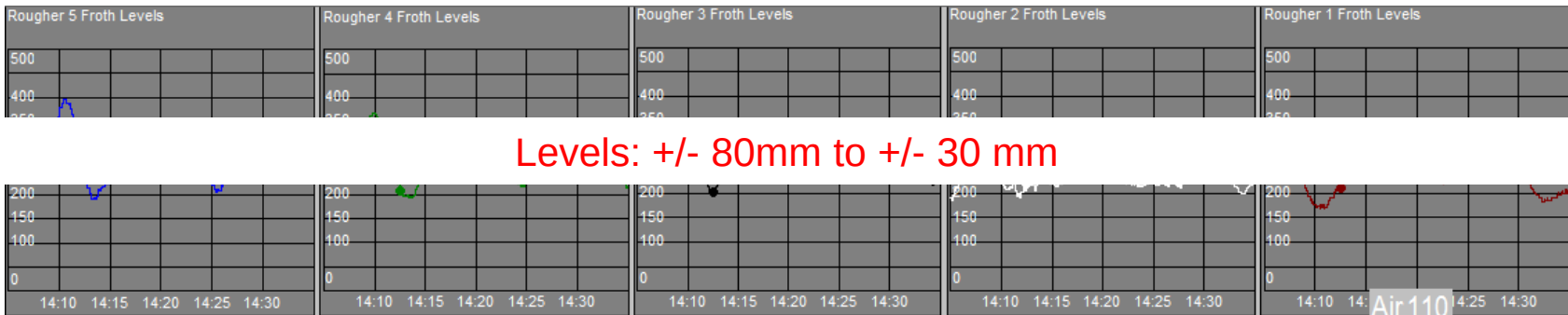
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Flotation Optimisation Results

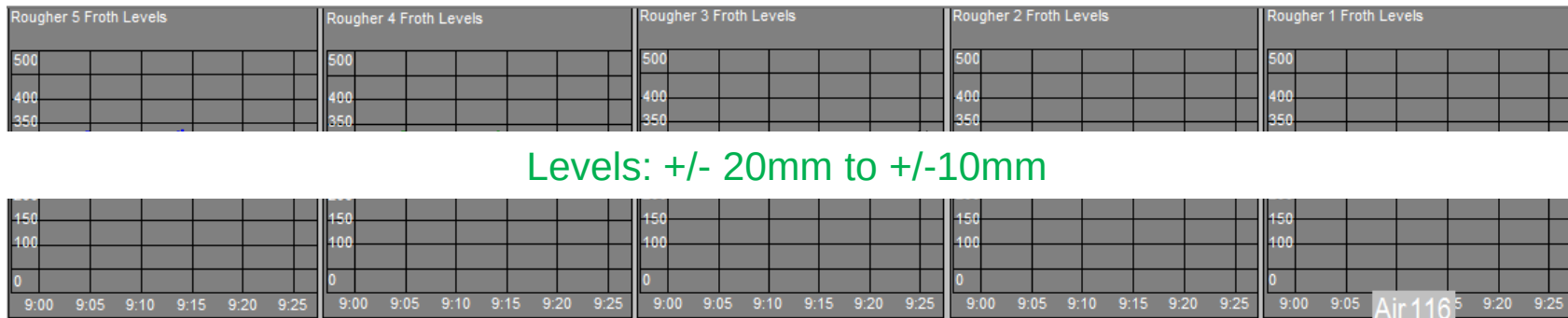


Rougher Flotation Cell Levels

Before



After



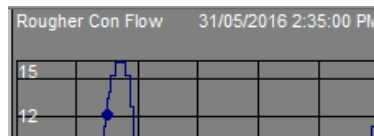
Flotation Optimisation Results



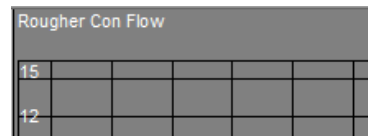
Before

After

Rougher
Con Flow

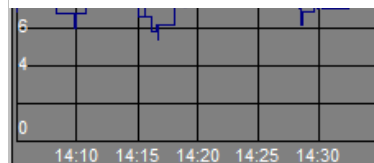


Flow: +/- 5 m3/h

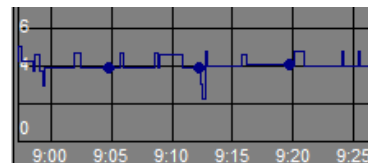


Flow: +/- 2 m3/h

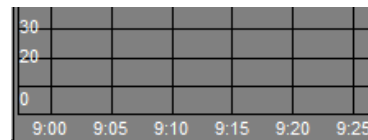
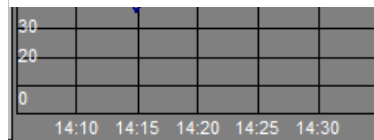
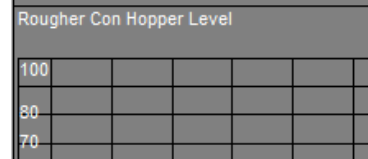
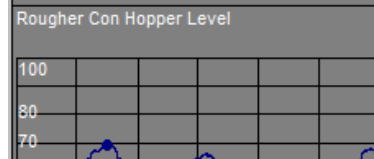
Rougher
Con Level



Level: +/- 35%



Level: +/- 3%



June 2016 Quarter

- Au Recovery ↑ 2.7%
- AISC ↓ 9.5%
- Net Debt ↓ \$7m

Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6	81.2	83.9		
Au Production (oz)	9,432	14,184	14,035		
AISC (\$/oz)	1,348	1,153	1,043		
EBITDA (\$m)	3.38	10.9	13.7		
Net Debt (\$m)	125	110	103		
Cash (\$m)	9.36	14.79	21.6		

September 2016 Quarter



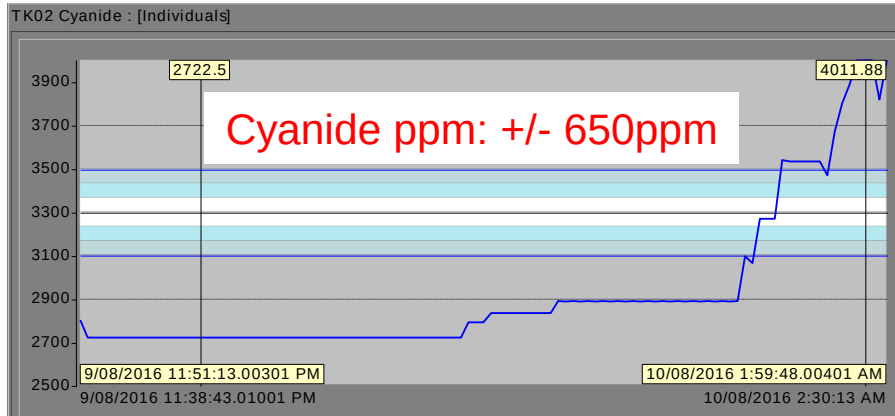
- Leach Circuit Optimisation
- OSA Integration into SCADA and PI System
- +1,000 data points
- Installed **INFINITUM**

Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6	81.2	83.9		
Au Production (oz)	9,432	14,184	14,035		
AISC (\$/oz)	1,348	1,153	1,043		
EBITDA (\$m)	3.38	10.9	13.7		
Net Debt (\$m)	125	110	103		
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Leach Circuit Optimisation Results

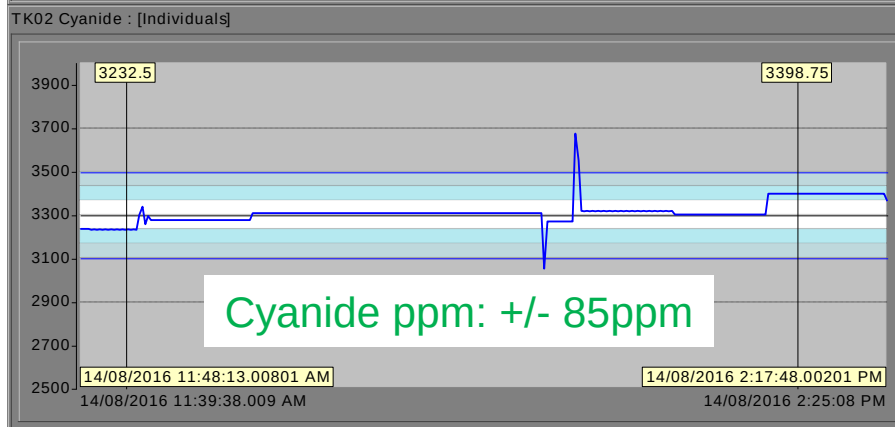


Before

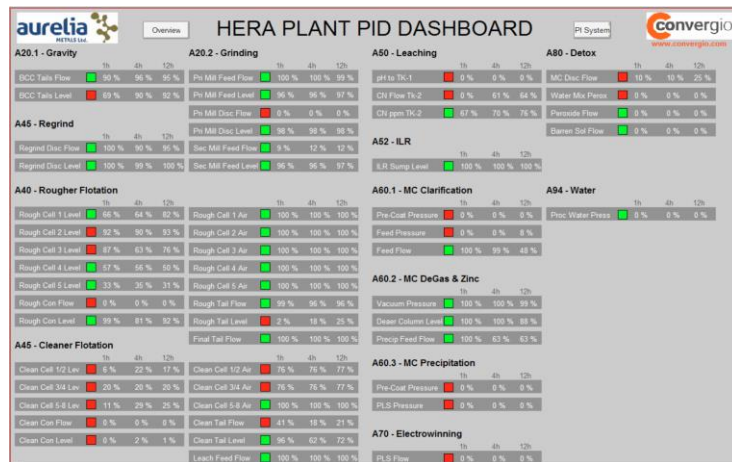


Tank 2 Cyanide
First pass
cascade loop

After



Protecting your profit with INFINITUM



Making sure your Process Control stays healthy

- Real-Time performance dashboard
- Automatic detailed performance reports for engineers, and high-level reports for managers
- Regular process control health checks

September 2016 Quarter



- Au Recovery ↑ 0.4%
- Planned Plant Shutdown successfully executed and fully funded*

Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6	81.2	83.9	84.3	
Au Production (oz)	9,432	14,184	14,035	9,254*	
AISC (\$/oz)	1,348	1,153	1,043	1,238*	
EBITDA (\$m)	3.38	10.9	13.7	8.0*	
Net Debt (\$m)	125	110	103	102.3	
Cash (\$m)	9.36	14.79	21.6	22.1	

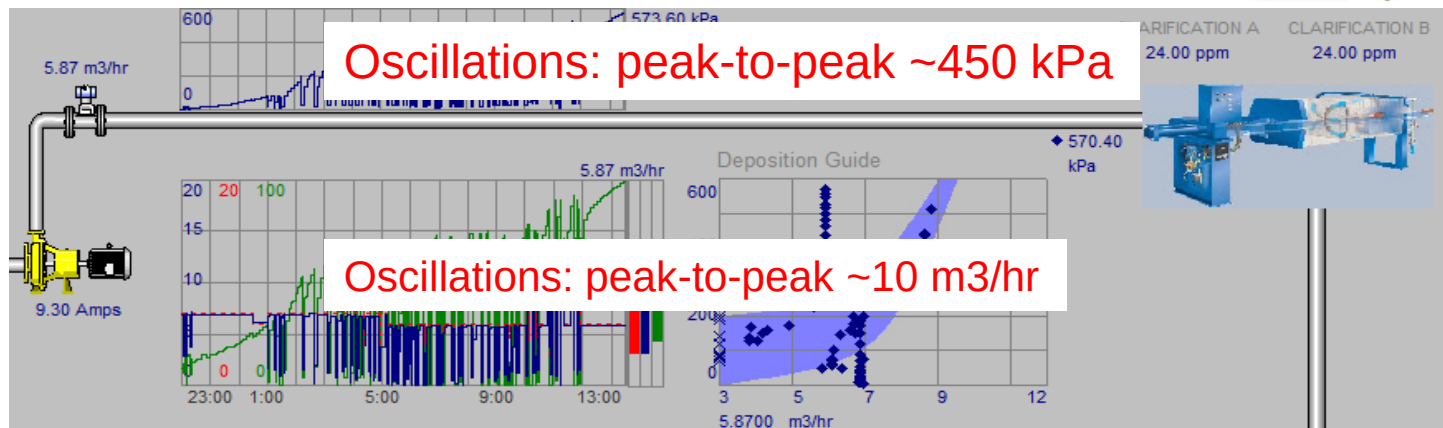
December 2016 Quarter

- Filter Press Optimisation

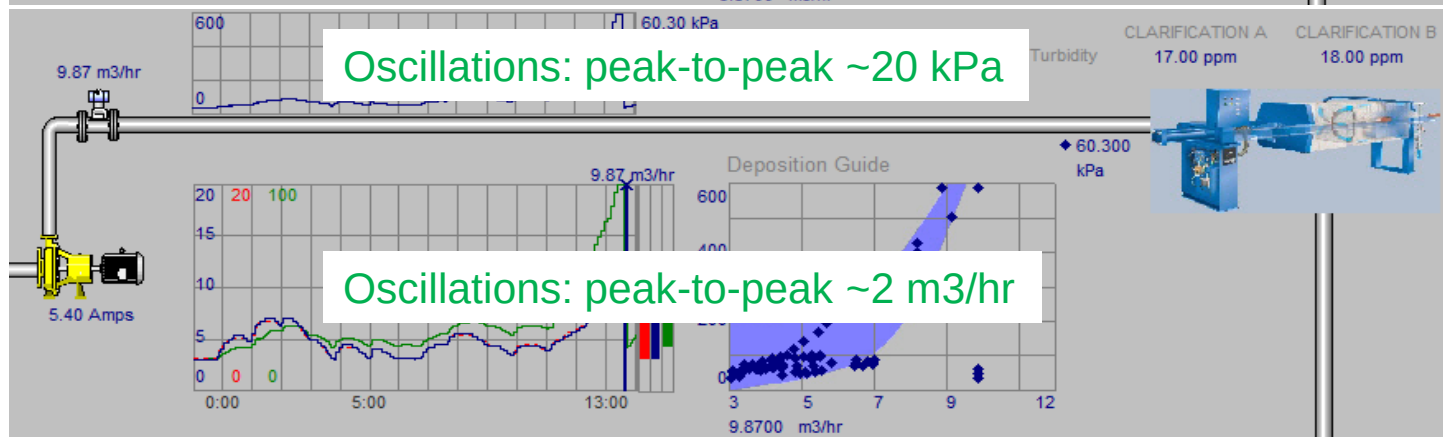
Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
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Net Debt (\$m)	125	110	103	102.3	
Cash (\$m)	9.36	14.79	21.6	22.1	

Clarification Filter Press Optimisation Results

BEFORE

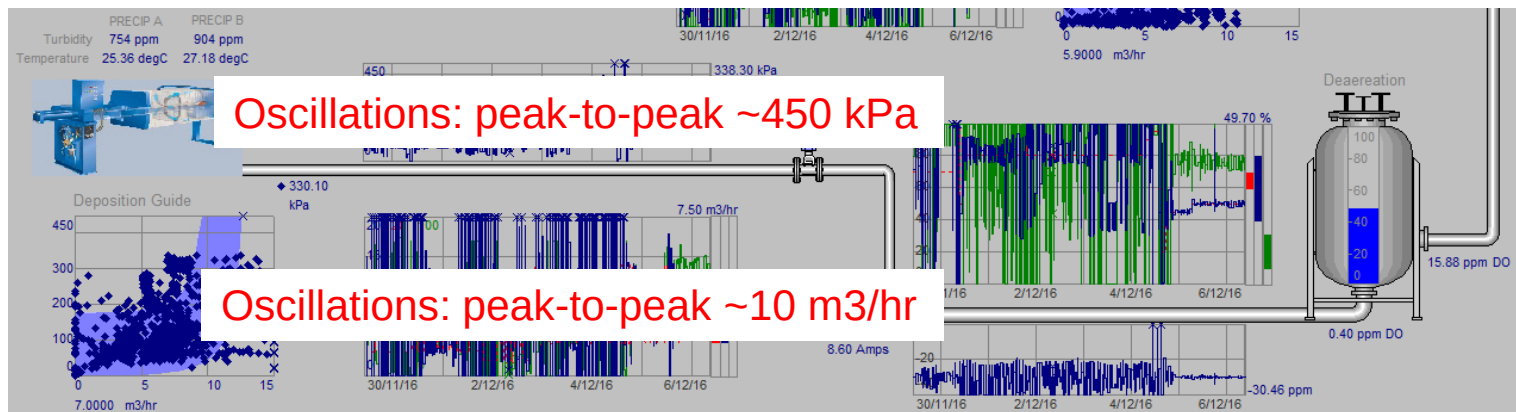


AFTER

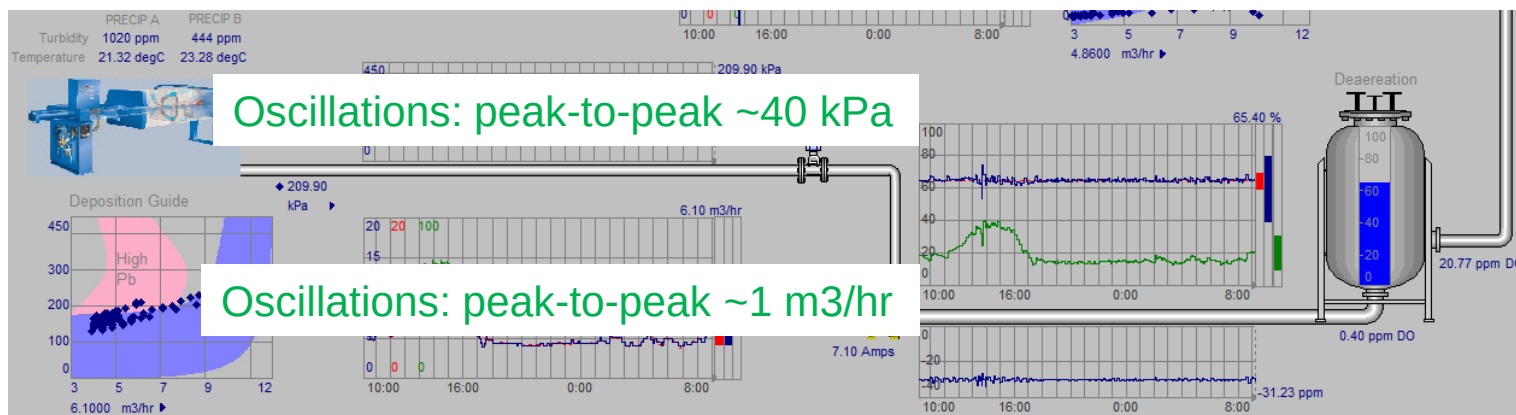


Precipitation Filter Press Optimisation Results

BEFORE



AFTER



December 2016 Quarter

- Au Recovery ↑ 4.3%
- AISC ↓ 33% from Sep-16 Qtr and ↓ 21% from Jun-16 Qtr
- Net Debt ↓ \$8.7m

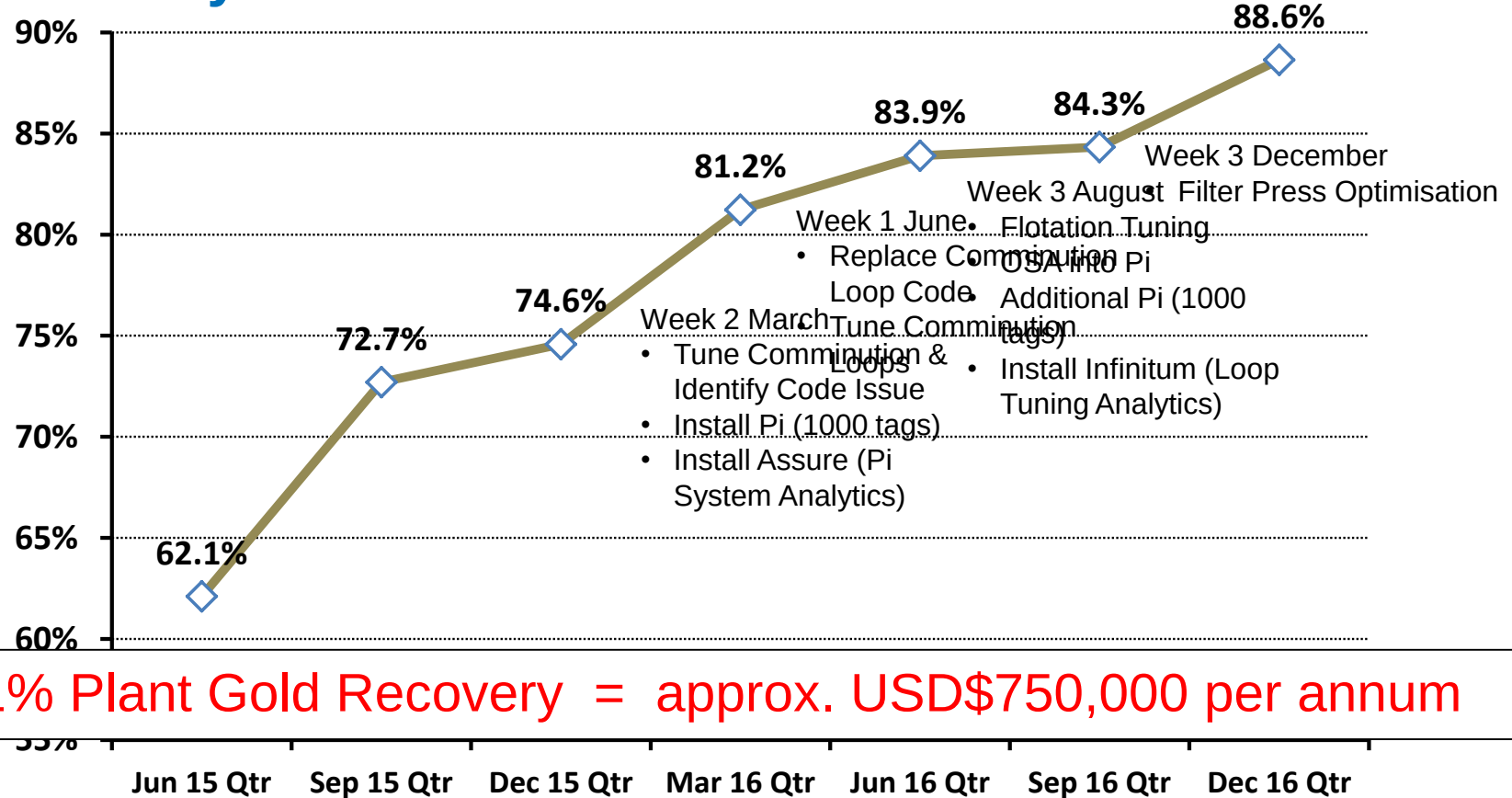
Period	Dec-15 Qtr	Mar-16 Qtr	Jun-16 Qtr	Sep-16 Qtr	Dec-16 Qtr
Au Recovery (%)	74.6	81.2	83.9	84.3	88.6
Au Production (oz)	9,432	14,184	14,035	9,254*	13,427
AISC (\$/oz)	1,348	1,153	1,043	1,238*	821
EBITDA (\$m)	3.38	10.9	13.7	8.0*	13.2
Net Debt (\$m)	125	110	103	102.3	93.6
Cash (\$m)	9.36	14.79	21.6	22.1	21.4



The Results

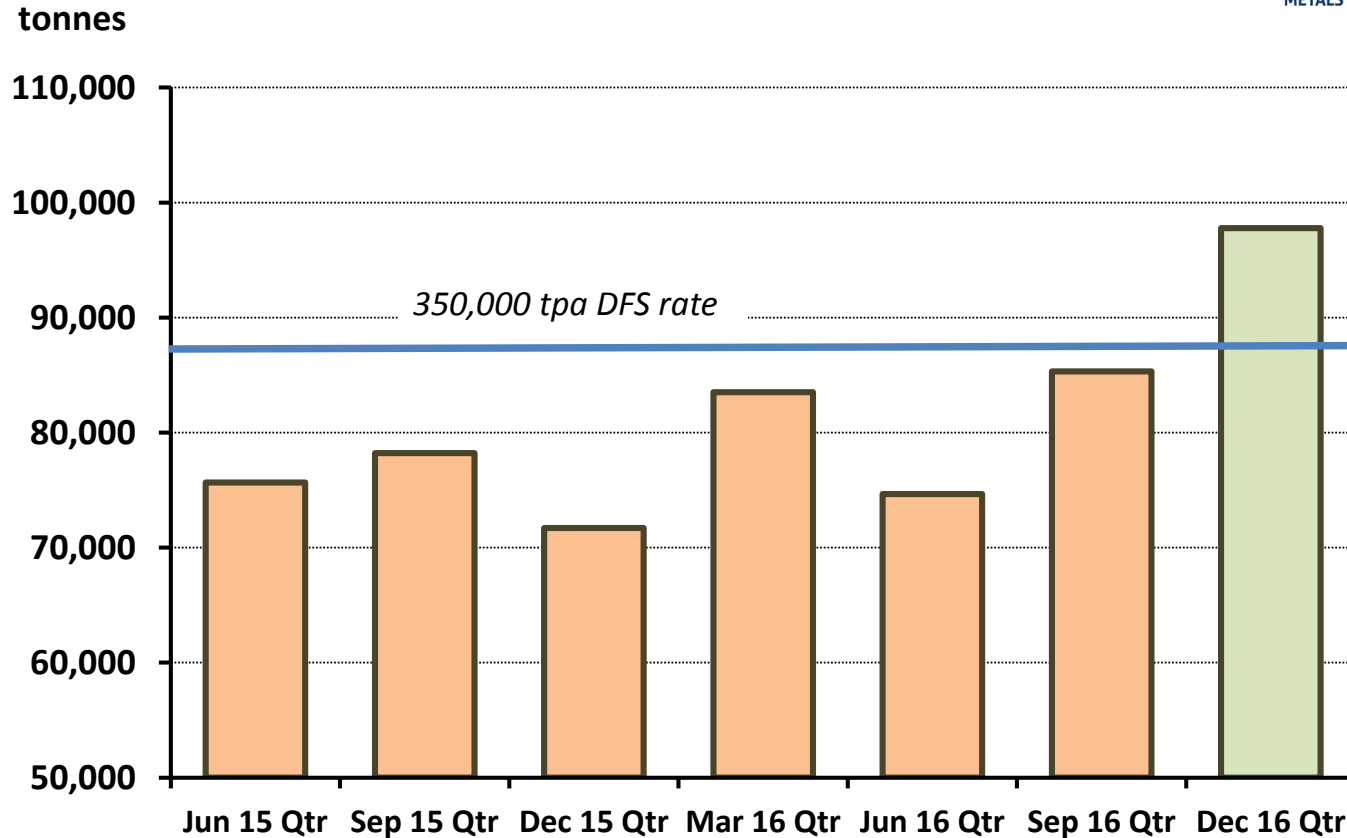
Au Recovery

Quarterly Gold recovery

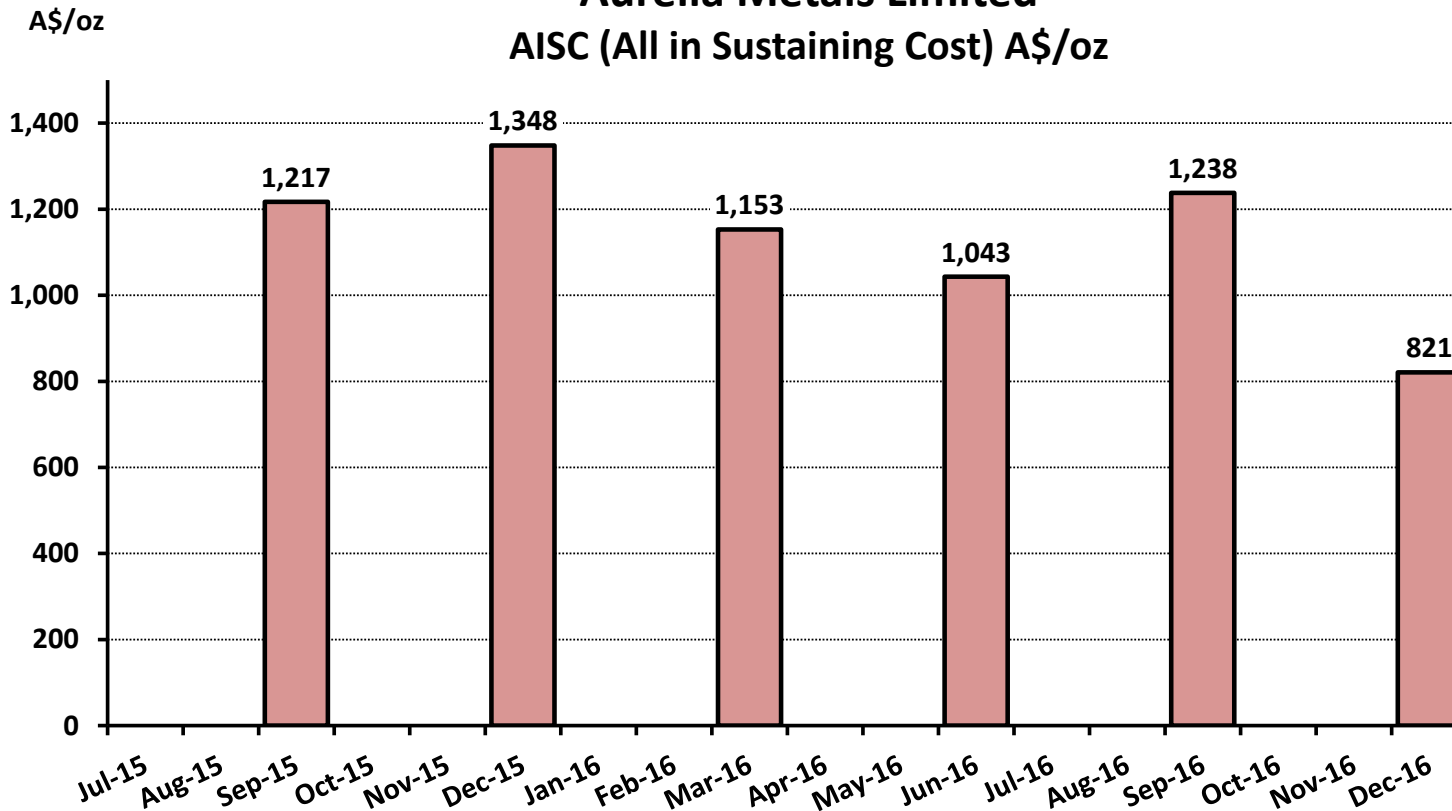


+1% Plant Gold Recovery = approx. USD\$750,000 per annum

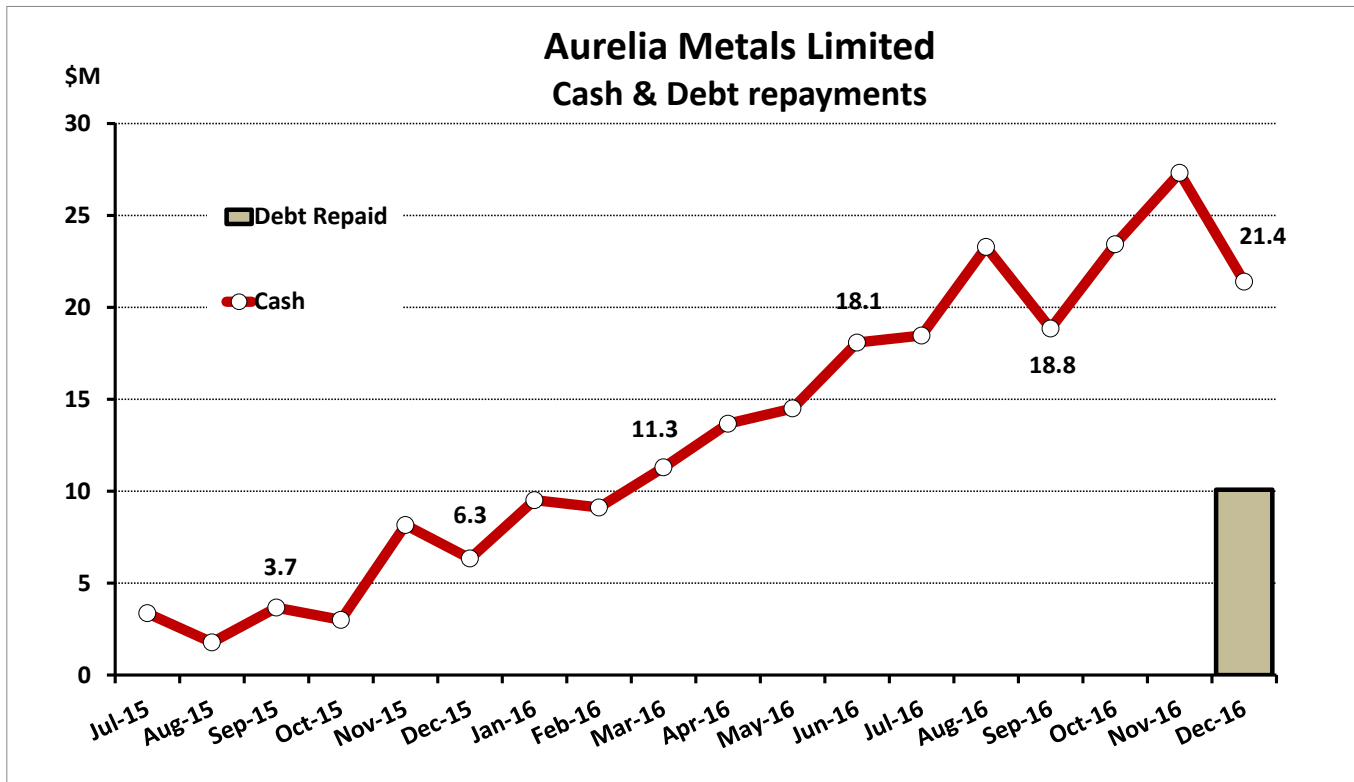
Throughput (dmt) Quarterly Processing Throughput



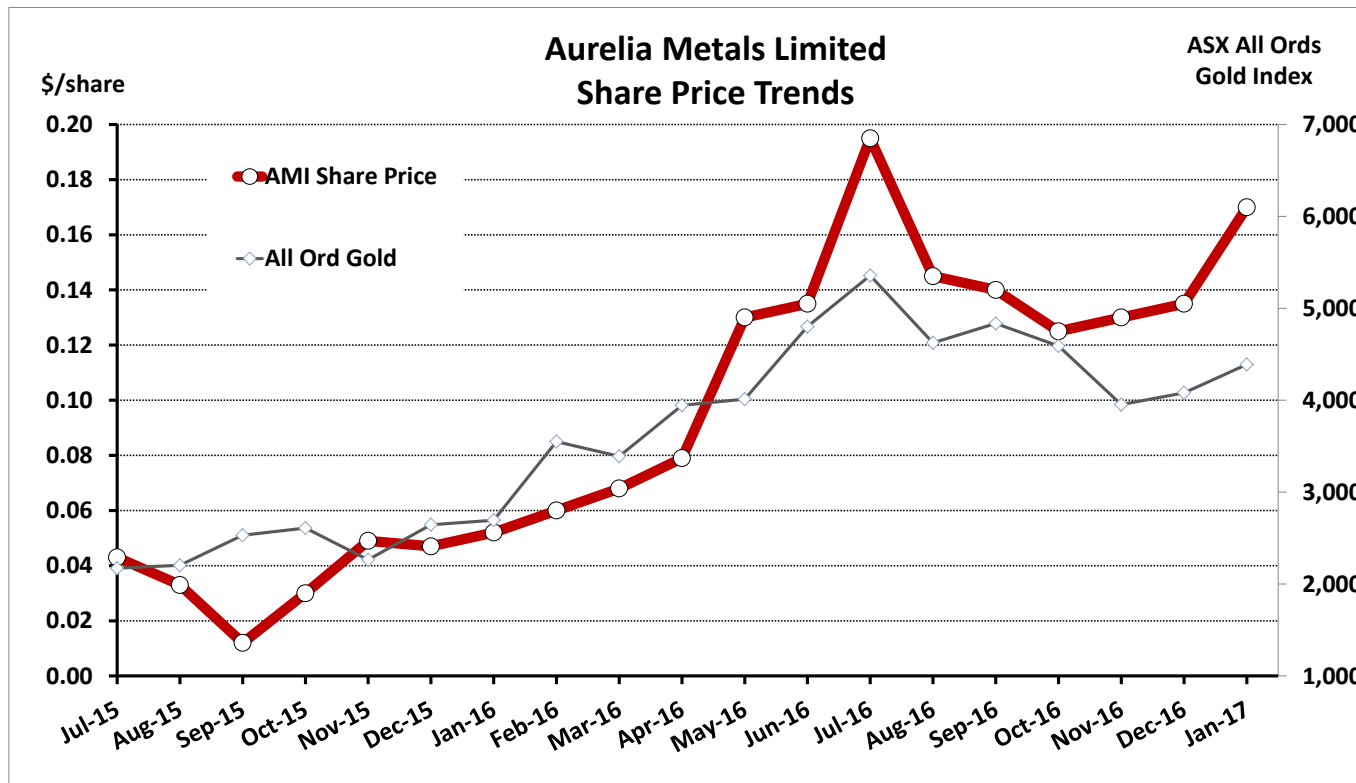
Aurelia Metals Limited AISC (All in Sustaining Cost) A\$/oz



Cash Holdings & Debt Repayments



Share Price

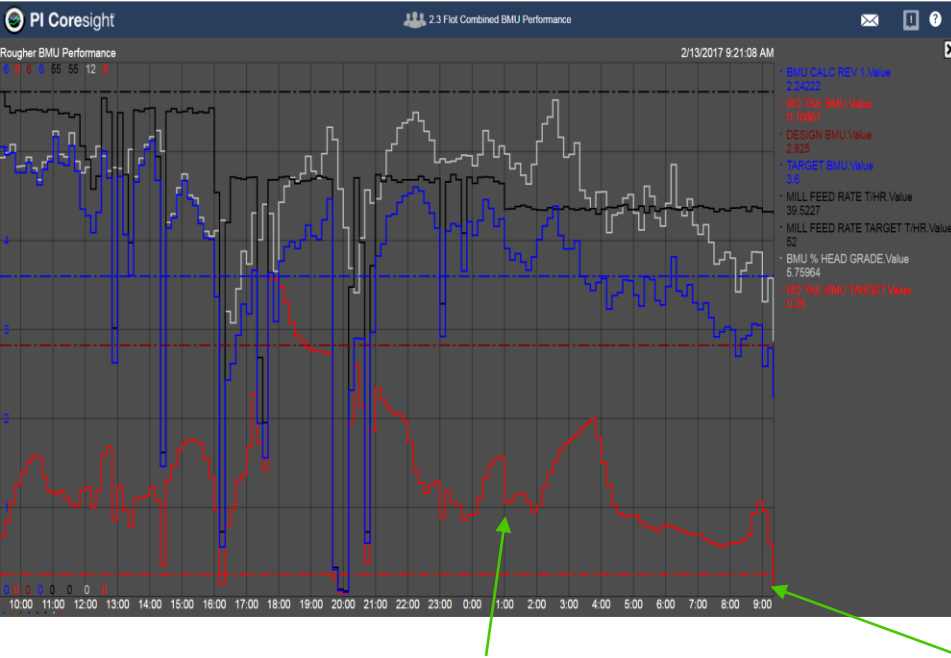




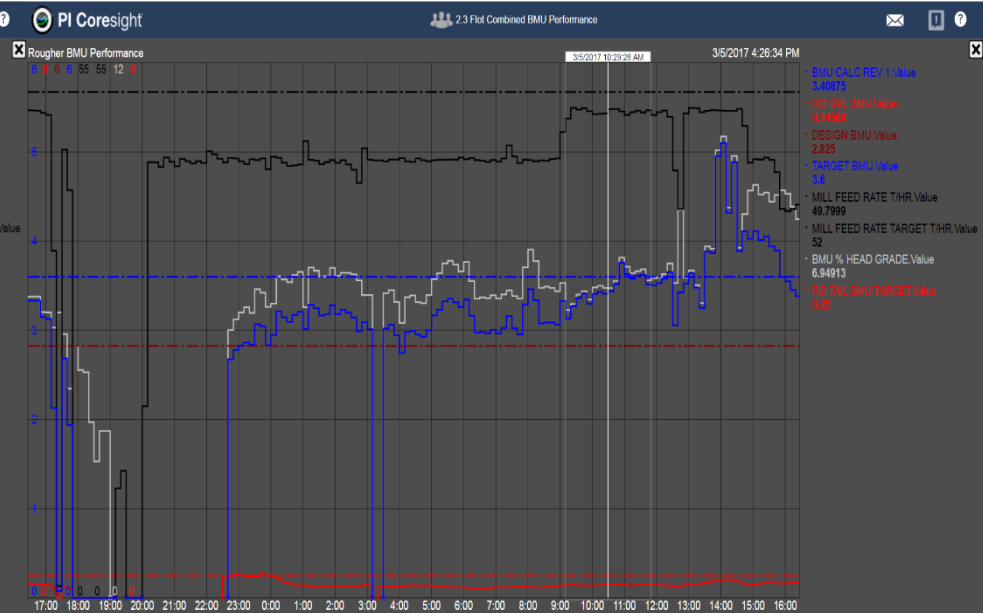
What's next?

Model Based Control (Base Metal Throughput)

BEFORE



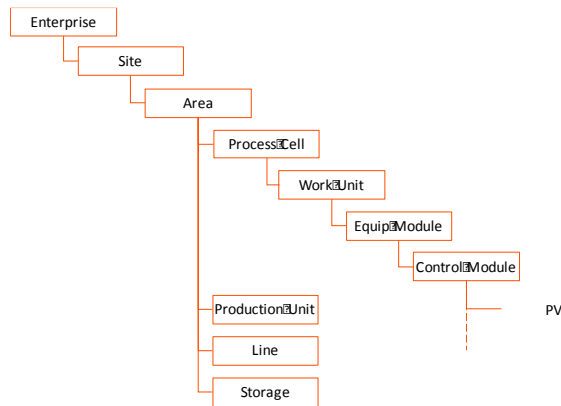
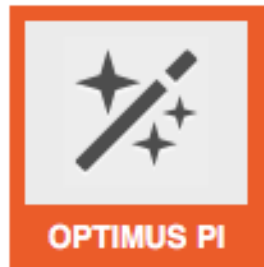
AFTER



Solid Red Line above Dashed Red Line = \$\$\$ to Tailings

- Improved Reagent Dosage (Caustic, Cyanide, Collector, Activator) using flow control Loops via SCADA
- Nuclear Density Feed Control for Flotation, Leaching and Tailings
- Reagent Dosing Linked to Feed Base Metal Units (Collector, Cyanide)

Maximise PI System value with **OPTIMUS PI**



Get your PI System correctly configured and certified

- Annual certification that your PI System is set up correctly
- Regular system configuration check and tune-up
- Remove any non-standard or obsolete system configurations
- Develop and maintain a single Asset Framework data structure aligned with ISA-95

Contact Information

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Director
Convergio



Questions

Please wait for the **microphone** before asking your questions



State your **name & company**

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감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado

Cheers Mate